What is claimed is:

1. A magnetic flux control means for a permanent-magnet motor-generator, comprising a rotor supported for rotation in a stator housing and composed of more than one permanent-magnet piece arranged circumferentially in a way spaced apart from each other, a stator fixed to the stator housing to surround around an outside periphery of the rotor and composed of a stator core with teeth providing sequential slots, and windings laid in the slots, an annular member arranged in close contact with the stator for angular movement with keeping sliding contact with the stator, a driving means to move the annular member with respect to the stator, and a controller for energizing the driving means in response to rpm of the rotor to control a position of the annular member relatively to the stator, thereby regulating a magnetic flux density in the teeth of the stator to give a preselected desired voltage.

2. A magnetic flux control means for a motor-generator constructed as defined in claim 1, wherein the annular member is arranged inside the stator and comprised of a permeable piece less in width than the slot defined between any two adjacent teeth in the stator core, and a nonmagnetic piece interposed between any two adjacent permeable pieces, and wherein the

windings laid in the stator are composed of a high-tension winding of more than one winding set for a power source, a low-tension winding of more than one winding set and a voltage-variable winding of at least one winding set for voltage control while the controller serves for controlling on-off operation of a switching means to change over connections among the winding sets, thereby varying a number of turns of the high-tension winding and the low-tension winding.

3. A magnetic flux control means constructed as defined in claim 2, wherein the controller operates the switching means depending on the rpm of the rotor to either connect in any of series and parallel or leave unconnected the high-tension winding and the low-tension winding, thereby giving any desired constant voltage.

4. A magnetic flux control means constructed as defined in claim 2, wherein the controller energizes the driving means to move circumferentially the annular member between an angular position where any clearance between any permeable piece in the annular member and the opposing tooth in the stator is made reduced so that the magnetic flux is unrestricted and another angular position where the clearance is made large so as to restrict the magnetic flux to thereby lower an

output voltage.

5. A magnetic flux control means constructed as defined in claim 2, wherein the controller at low speed of the rotor energizes the switching means to connect in series the windings sets of the high-tension winding, thereby increasing the number of turns of the high-tension winding, whereas at high speed of the rotor gets the switching means to leave unconnected the winding sets of the high-tension winding from each other, and further when the rpm of the rotor starts to go too higher, the controller operates the driving means to move circumferentially the annular member, whereby the high-tension winding produces a preselected desired constant voltage.

6. A magnetic flux control means constructed as defined in claim 2, wherein the controller at low speed of the rotor energizes the switching means to connect in series the windings sets of the low-tension winding, whereas at high speed of the rotor gets the switching means to connect the winding sets of the low-tension winding in a way to reduce the number of turns, and further when the rpm of the rotor starts to go too higher, the controller operates the switching means to either connect in parallel or leave unconnected the winding sets and also energize the driving means to

move circumferentially the annular member, whereby the low-tension winding produces a preselected desired constant direct-voltage.

7. A magnetic flux control means constructed as defined in claim 2, wherein the controller carries out connection control of the winding sets of the low-tension winding in a way corresponding to a signal for connection control of the winding sets of the high-tension winding.

8. A magnetic flux control means constructed as defined in claim 2, wherein a voltage created in the voltage-variable winding is rectified to a variable direct voltage.

9. A magnetic flux control means constructed as defined in claim 1, wherein the annular member is comprised of permeable pieces each of which is formed in a rectangular shape in cross section having a width less than that of the slot between any two adjacent teeth in the stator, the permeable pieces being arranged in juxtaposition along an inside periphery of the stator with nonmagnetic pieces being each interposed between any two permeable pieces, and the permeable pieces are each chamfered off at corners on a radially outside circumference of the rectangular shape in cross section to provide first chamfered areas, so

that when any permeable piece is placed in opposition to any slot in the stator, first clearances of preselected amount are left between the first chamfered areas and widthwise opposing corners of the associated teeth on a radially inside circumference of the stator.

10. A magnetic flux control means constructed as defined in claim 9, wherein the tooth in the stator is chamfered off at its tooth tip corners to provide second chamfers so that the first clearances are formed in magnetic path clearances defined between the first and second chamfered areas.

11. A magnetic flux control means constructed as defined in claim 9, wherein a second clearance of preselected amount is provided between the inside periphery of the annular member and an outside periphery of the rotor.

12. A magnetic flux control means constructed as defined in claim 9, wherein the windings are wound on the teeth of the stator core in the stator so as to generate electricity in phase, and also grouped into more than one winding set to be connected in series to provide the turns different in number, while the controller serves for regulating angular position of the annular member with respect to the stator and further for connecting in series and/or in parallel the

winding sets, depending on the rpm of the rotor, thereby giving a preselected desired voltage.

13. A magnetic flux control means constructed as defined in claim 1, wherein the annular member is arranged around an outside periphery of the stator and has magnetic flux control grooves cut into an inner peripheral surface thereof, with remaining ribs between the grooves, which are extended axially of the stator and spaced apart away from each other at regular intervals around the curved inner surface, so that the sequential ribs between the slots form at their inside tips a curved surface that comes into close sliding contact with the outside periphery of the stator.

14. A magnetic flux control means constructed as defined in claim 13, wherein the grooves inside the annular member are each made roughly equivalent in a circumferential length with any one tooth in the stator.

15. A magnetic flux control means constructed as defined in claim 13, wherein an outside peripheral path for magnetic flux in the stator core is made less in width by a width of a magnetic path in the annular member.

16. A magnetic flux control means constructed as defined in claim 13, wherein the magnetic flux passing through any tooth in the stator core is restricted when

any groove in the annular member comes into radial alignment with the tooth, whereas the magnetic flux passing through any tooth in the stator core remains unrestricted when any rib in the annular member comes into radial alignment with the tooth.

17. A magnetic flux control means constructed as defined in claim 13, wherein the grooves in the annular member are charged with nonmagnetic solid lubricant to reduce a frictional resistance that is encountered when the annular member slides over the stator core.

18. A magnetic flux control means constructed as defined in claim 13, wherein the slots in the stator are charged with resinous strengthening material to improve stiffness of the stator.

19. A magnetic flux control means constructed as defined in claim 13, wherein the annular member is composed of a pair of annular halves, which are arranged so as to move circumferentially in directions opposite to each other by the action of the driving means.

20. A magnetic flux control means constructed as defined in claim 13, wherein the driving means is a reversible motor that has a reversible rotary shaft around which a clockwise thread and a counterclockwise thread are formed, while on the annular halves there

are fixed nuts that have threads, each to each nut, mating the threads around the rotary shaft, respectively.

21. A magnetic flux control means constructed as defined in claim 13, wherein the windings are wound on the teeth of the stator core in the stator and also grouped into more than one winding set different from each other in a number of turns, while the controller in response to the rpm of the rotor serves to control an angular position of the annular member with respect to the stator and further to make at least any one of series and parallel connections of the winding sets, thereby giving a preselected desirable voltage.

22. A magnetic flux control means constructed as defined in claim 21, wherein the controller, when the motor-generator operates as generator, connects the winding sets in series in response to a low rpm of the rotor to produce a high voltage, while connects any winding sets in parallel in response to a high rpm of the rotor to produce a large current with even desired voltage.

23. A magnetic flux control means constructed as defined in claim 21, wherein the controller, when the motor-generator operates as motor, connects the winding sets in series in response to a low rpm of the rotor to

produce a high magnetic force, while connects any winding sets in parallel in response to a high rpm of the rotor to reduce the number of turns to provide a desired magnetic force.

24. A magnetic flux control means constructed as defined in claim 21, wherein with the windings shunt-wound in the stator core, conductors of the windings so wound as to become identical in phase are connected in series at a low rpm range and are led out on the way to reduce the number of turns as the rpm of the rotor increases, while the circumferentially shunt-wound windings are either connected in parallel or left unconnected with each other at a high rpm of the rotor to thereby allow, with being coupled with the angular position control of the annular member, to give either a constant voltage or a constant torque.

25. A magnetic flux control means constructed as defined in claim 21, wherein the windings on the stator are constituted in phase in matching with a number of poles of permanent magnets on the rotor, while the winding sets are connected in parallel, thereby providing the generator capable of producing a large current with even the desired voltage.

26. A magnetic flux control means constructed as defined in claim 1, wherein the annular member is

arranged inside the stator and is comprised of density-rich permeable parts in which permeable materials are densely laminated in the form of a circle, and density-lean permeable parts in which permeable chips are arranged circularly in a manner spaced apart from each other at an interval of circumferential length equivalent to a circumferential width of the tooth and nonmagnetic chips are each arranged in a space left open between any two adjacent permeable chips, the nonmagnetic chips being made of nonmagnetic reinforcing material such as aluminum and so on, and the density-rich and density-lean permeable parts unlike in density being arranged alternately along the axial direction.

27. A magnetic flux control means constructed as defined in claim 26, wherein the permeable chips are arranged circularly in such a way to leave a space open between any two adjacent permeable chips, the space being equal in number to the teeth and provided at an interval of length equivalent to a circumferential width of the tooth in the stator.

28. A magnetic flux control means constructed as defined in claim 26, wherein the density-rich permeable parts and the permeable chips are made of circular permeable plates laminated densely at an equal interval.

29. A magnetic flux control means constructed as

defined in claim 26, wherein the density-lean parts of the annular member are each composed of annular permeable steel plates overlaid axially one on the other, the annular permeable steel plate being made of arched density-lean chips and density-rich chips, which are arranged in the form of cylinder in a manner spaced apart at an equal interval, and windows left open between chips unlike in density are filled with the nonmagnetic reinforcing material.

30. A magnetic flux control means constructed as defined in claim 26, wherein the density-rich parts of the annular member are each made of an axial lamination of a permeable ring and a silicon-steel plate, which are jointed together.

31. A magnetic flux control means constructed as defined in claim 26, wherein a hollow cylinder of thin silicon steel plate is press-fit inside an inner surface of the teeth in the stator.

32. A magnetic flux control means constructed as defined in claim 26, wherein the annular member is provided at axially opposing ends thereof with outer rings, each to each end, to keep the magnetic force against leaking out from the axially opposing ends, the outer rings being made of a silicon steel plate superior in permeability.

33. A magnetic flux control means constructed as defined in claim 26, wherein the annular member is arranged inside the stator, with an outside periphery thereof being kept in close contact with an inner tips of the teeth in the stator for sliding movement, and the driving means includes any axial end of the annular member, to which is applied a rotating force for moving circumferentially the annular member, a rod transmitting the rotating force to the axial end, and an actuator to move in and out the rod.

34. A magnetic flux control means constructed as defined in claim 26, wherein the windings are wound on the teeth of the stator core in the stator so as to generate electricity in phase and also grouped into more than one winding set to be connected in series to provide the turns different in number, while the controller serves for regulating angular position of the annular member with respect to the stator and further for making at least any one of series and parallel connections among the winding sets, depending on the rpm of the rotor, thereby giving a preselected desired voltage.

35. A magnetic flux control means constructed as defined in any one of claims 2, 9 and 26, wherein the nonmagnetic piece is either replaced with air or made

of any reinforcing member of aluminum, resinous material and so on.

36. A magnetic flux control means constructed as defined in any one of claims 2, 9 and 26, wherein the annular member is made of an axial lamination of more than one ring member in which the permeable piece and the nonmagnetic piece are overlaid one on the other.

37. A magnetic flux control means constructed as defined in any one of claims 2, 9 and 26, wherein the driving means is composed of any axial end of the annular member, to which is applied a rotating force for moving circumferentially the annular member, a rod transmitting the rotating force to the axial end, and an actuator to move in and out the rod.

38. A magnetic flux control means constructed as defined in any one of claims 2, 9 and 26, wherein the driving means includes a d-c motor and the controller selects more than one position of the rod sensed by a position sensor and energizes the driving means to move in and out the rod.

39. A magnetic flux control means constructed as defined in any one of claims 2, 9 and 26, wherein the driving means includes a solenoid-operated valve having a rod connected to any one axial end of the annular member, while the controller selects more than one

position of the rod sensed by a position sensor and transforms a load voltage applied to the solenoid-operated valve, moving the rod to rotate the annular member.

40. A magnetic flux control means constructed as defined in any one of claims 2, 9, 13 and 26, wherein the controller has an inverter function that rectifies an electric current produced at a preselected desired voltage to output an alternating-voltage of a preselected constant voltage.